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| **Lesson Title : Surviving a School Shooting** | **Unit #: 1** | **Lesson #: 1** | **Activity #: 2** |
| **Activity Title: Survival Ideas** |

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| **Estimated Lesson Duration:** | **2-3 Class Periods (60 to 70 min each)** |
| **Estimated Activity Duration:** | **2 Class Periods (60 to 70 min)**  **(1 Period for Research)**  **(1 Period for Presentations)** |

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| **Setting:** | **Classroom** |

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| **Activity Objectives:**   1. The student will determine what characteristics distinguish Newtonian from non-Newtonian materials. 2. The student will identify the different types of non-Newtonian fluids. 3. The student will identify common non-Newtonian fluids found in the home. 4. The student will be able to hypothesis whether non-Newtonian fluids can stop a bullet. |

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| **Activity Guiding Questions:**   1. **What’s the difference between Newtonian fluids and Non-Newtonian fluids (NNF)?** 2. **How are NN fluids used to create bullet-proof materials?** 3. **What materials are needed to make NNF at home?** 4. **Can homemade NNF stop a bullet?** 5. **How could a NNF be used to make a homemade bulletproof vest?** |

| **Next Generation Science Standards (NGSS)** | |
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| **Science and Engineering Practices (Check all that apply)** | **Crosscutting Concepts (Check all that apply)** |
| Asking questions (for science) and defining problems (for engineering) | Patterns |
| Developing and using models | Cause and effect |
| Planning and carrying out investigations | Scale, proportion, and quantity |
| Analyzing and interpreting data | Systems and system models |
| Using mathematics and computational thinking | Energy and matter: Flows, cycles, and conservation |
| Constructing explanations (for science) and designing solutions (for engineering) | Structure and function. |
| Engaging in argument from evidence | Stability and change. |
| Obtaining, evaluating, and communicating information |  |

| **Ohio’s New Learning Standards for Science (ONLS)** |
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| **Expectations for Learning - Cognitive Demands (Check all that apply)** |
| Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| Demonstrating Science Knowledge **(D)** |
| Interpreting and Communicating Science Concepts **(C)** |
| Recalling Accurate Science **(R)** |

| **Common Core State Standards -- Mathematics (CCSS)** | |
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| **Standards for Mathematical Practice (Check all that apply)** | |
| Make sense of problems and persevere in solving them | Useappropriate tools strategically |
| Reason abstractly and quantitatively | Attendto precision |
| Construct viable arguments and critique the reasoning of others | Look for and make use of structure |
| Model with mathematics | Look for and express regularity in repeated reasoning |

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| **Unit Academic Standards (NGSS, ONLS and/or CCSS):**   * CCSS.Math.Content.HSS-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. * CCSS.Math.Content.HSS-IC.A.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. |

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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies)  Handout: 1.1.2.a Document “Researching Non-Newtonian Fluids” |

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| **Teacher Advance Preparation:**  The teacher should anticipate the “Guiding Questions” that students will brainstorm in order to be prepared to guide the discussion. |

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| **Activity Procedures:**  **Note: I recommend allowing students to work in groups of 2 to 3 for this activity.**  **Day 1 of Activity 2**   1. Present “The Challenge” to the class. **The Challenge**: *Can you make an affordable homemade bulletproof vest that can stop a bullet?* This Challenge is based on the Guiding Questions and discuss that took place in Lesson 1: Activity 1. 2. Hand out the “Activity 2 – Researching Non-Newtonian Fluids” student handout. 3. The first 15 minutes of the class period for this activity will be a class discussion where students brainstorm Guiding Questions that can then be researched by the students. 4. The rest of the class period should be used for online research about Non-Newtonian Fluids. Students should be finding the answers to the Guiding Questions they brainstormed in the first part of this activity. 5. Save the last 5 to 10 minutes of class to allow each Team to discuss how they are going to give their presentation for the next class period. 6. If students do not get all of their research completed during class, they need to finish the research for HW. 7. Students should also prepare their short 4 to 5 minute presentation for the next class period for HW.   **Day 2 of Activity 2**   1. Students should have prepared a 4 to 5 minute presentation based on their research from the day before. 2. Each group will then give their presentation to the class. You can randomly choose the order of the presentations or ask for volunteers. 3. A presentation rubric is included in the Summative Assessments links below. |

**Formative Assessments:**

As a formative assessment for this activity, the teacher should check with each Team to make sure they are finding answers to their Guiding Questions.

Some “check point” questions that the teacher can ask each Team include:

1. What were the Guiding Questions that your Team decided to research?
2. Why did you decide on those Guiding Questions?
3. How do you think the answers to those Guiding Questions will help you complete The Challenge?
4. What answers are you finding to the Guiding Questions?
5. Is there anything that stands out as interesting from your research so far?

Another formative assessment for this activity and can be completed during Day 1 is to ask each Team about how they plan to give their presentation. Some questions the teacher can ask include:

1. What is each Team Member going to talk about tomorrow?
2. What will be the focus of your presentation?
3. How will you relate what you’ve learned back to The Challenge?

**Summative Assessments:**

A summative assessment can be given as a rubric to grade the presentation on the 2nd day of the activity.

Presentation Rubric: 1.1.2.b

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| **Differentiation:**  For students that perform at a below average level, it can be helpful to group them with students that perform at an above average level. Throughout this Unit different skills will be required, therefore the teacher should evaluate each student’s work habits and create effective teams based on that evaluation. |

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| **Reflection:** After completing this activity for the first time, I noticed that many teams of students wanted to focus too much on the design of the final product and not getting answers to the guiding questions. In the future, I will do my best to help students understand that the “Guiding Questions” are there to lead them to making the final product (aka the bulletproof material).  In other words, students need to follow the course laid before them and not try to jump to the end. |